

ERGONOMICS DEMONSTRATION PROJECT

# Utility Vault

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### Ergonomics Demonstration Project Report

#### Introduction

Rebar tying is a very repetitive task, requiring hand repetition and force, which can exceed Hazard Zone levels of the Washington State Ergonomics Rule if done regularly throughout the day. Previously, engineering controls for this activity have been relatively limited. Prototype tools have been developed to aid rebar tying; however, most either have slowed down the work or have not significantly lowered the level of exposure to risk factors. New advances in tool technology have made off-the-shelf automatic rebar tiers a reality. Utility Vault has successfully used these tools to reduce the Hazard Zone risk factors associated with concrete reinforcement tying, while increasing productivity.

#### Concrete Reinforcement at Utility Vault

Utility Vault is a manufacturer of underground concrete utility vaults and other pre-cast concrete products. The work is completed in a manufacturing facility as a fixed production system, though the materials and products are the same as those at construction sites throughout the state. Utility vaults, their primary product, require a large number of reinforcement ties to secure both mesh and rods. When large jobs were secured or production increased, the company found that this activity could be the bottleneck in the production process. Initially this factor, combined with the knowledge that this was a demanding task, prompted the company to investigate automated tools for tying the reinforcement.

The first automated tier was purchased in early 2002. The success of the tool has led to the purchase of 4 additional tools so that all workers tying reinforcement primarily use automated tiers to perform the task. The use of these tools has removed the bottleneck and removed the Hazard Zone risk factor of repetitive hand motion with high force and awkward posture. Figure 1 shows workers using tiers to tie reinforcement for utility vaults.

The tiers have been a success at Utility Vault and show promise for application in reinforcement tying in other manufacturing processes and building construction. The tiers are relatively lightweight at about 5 lbs and require low trigger activation force. The tying is completely automated once the tool jaws are placed in position and the trigger is activated. Drawbacks to the use of these tools are the cost of the tool and wire, and tool reliability. The company maintenance director regularly has to service the rebar tiers but has learned to perform any needed maintenance in-house. The tools cost between \$1800-\$2200. The tool also cannot be used for all ties, as it may be difficult to access joints in restricted spaces. However, companies such as Utility Vault have found that most ties can be done with the tiers, and at a faster rate than a worker can do manually.



Figure 1. Utility Vault workers using rebar tiers on reinforcement mesh and rods.

The rebar tying tool used by Utility Vault uses a lighter-gauge wire than is the standard in construction. However, a newer model has been introduced that uses standard-gauge wire and has been designed to be more water/dust resistant and durable. This newer tool may prove successful in reducing hand repetition with force associated with rebar tying in construction, helping reduce exposures below the Hazard Zone. A tool extension is also available that has been used in early testing with success and could reduce back bending significantly for horizontal tying. Even intermittent use of these tools during the day or through rotation on construction sites could successfully reduce Hazard Zone risk factors from rebar tying in construction. The process at Utility Vault has demonstrated that these tools are both feasible and productive in pre-cast concrete operations. Further iterations of these tools may lead to their use for all rebar tying as the standard in the future.



Figure 2. A rebar tying tool used by Utility Vault to secure reinforcement.